

Exhibit 3 – U.S. Army Range Safety Manual

Department of the Army
Pamphlet 385-63

Safety

Range Safety

Headquarters
Department of the Army
Washington, DC
10 April 2003

UNCLASSIFIED

Headquarters
Department of the Army
Washington, DC
10 April 2003

Department of the Army
Pamphlet 385-63

Safety

Range Safety

By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Official:



JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army

History. This is a new Department of the Army pamphlet.

Summary. The Army and Marine Corps will use this pamphlet in conjunction with Army Regulation 385-63/Marine Corps Order 3570.1B, to establish and maintain a comprehensive range safety program.

Applicability. The standards and procedures in this pamphlet apply to all personnel and range operations and activities on

Army or Marine Corps controlled property or within Army or Marine Corps jurisdiction. The provisions of this pamphlet apply in peacetime and contingency operations and are advisory for actual combat operations. Except for airspace and water traffic safety requirements, these provisions do not apply to development, proof and function test ranges, or laboratories. However, major Army commands and Marine Corps installations having such ranges and laboratories are required to develop and apply alternate standards that are appropriate to the mission and that ensure the preservation of life and property.

Proponent and exception authority. The Chief of Staff, Army, is the Army proponent. The proponent has the authority to approve exceptions to this pamphlet consistent with controlling law and regulation. The proponent has delegated approval authority to the Director of Army Safety.

Suggested improvements. Army users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications

and Blank Forms) directly to the Director of Army Safety, Office of the Chief of Staff, DACS-SF, 200 Army Pentagon, Washington, DC 20310-0200. Marine Corps users will submit comments and suggestions for improvements to the Commanding General, Marine Corps Combat Development Command (C46R), 3300 Russell Road, Quantico, VA 22134-5001.

Distribution. This publication is available to Army users in electronic media only and is intended for command levels A, B, C, D, and E for the Active Army, the Army National Guard of the United States, and the U.S. Army Reserve. Publication and distribution to authorized users for Marine Corps commands are indicated in the Table of Allowances for Publications.

Contents (Listed by paragraph and page number)

Chapter 1

Introduction, page 1

Purpose • 1-1, page 1

References • 1-2, page 1

Explanation of abbreviations and terms • 1-3, page 1

Applicability • 1-4, page 1

Deviations • 1-5, page 1

Installation and unit level Range Safety Program guidelines • 1-6, page 2

Guidelines for range safety certification programs • 1-7, page 7

Chapter 2

Ranges, page 8

Restricting access to impact areas • 2-1, page 8

Posting warning signs and markers • 2-2, page 8

Controlling other range usage • 2-3, page 9

UNCLASSIFIED

DISTRIBUTION STATEMENT A: Approved for public release;
distribution is unlimited.

Chapter 1

Introduction

1–1. Purpose

This pamphlet provides implementation guidance for the Army and Marine Corps (MC) Range Safety Programs prescribed in Army Regulation (AR) 385–63 and Marine Corps Order (MCO) 3570.1B. It provides standards and procedures for the safe firing of ammunition, demolitions, lasers, guided missiles, and rockets for training, target practice, and, to the extent practicable, combat.

1–2. References

Required and related publications and prescribed and referenced forms are listed in appendix A.

1–3. Explanation of abbreviations and terms

Abbreviations and special terms used in this pamphlet are explained in the glossary.

1–4. Applicability

a. This pamphlet applies to—

(1) The Active Army, United States Military Academy, the Army National Guard of the United States, U.S. Army Reserve, Department of the Army civilian employees, and contractors.

(2) Army Reserve Officers Training Corps during range or firing activities located on or within the jurisdiction of a military installation.

(3) Marine Corps commands active and reserve, unless the standards or procedures conflict with Department of the Navy or Headquarters, Marine Corps (HQMC) orders. Local standing operating procedures (SOP) and range policies will reinforce this pamphlet and AR 385–63/MCO 3570.1B.

(4) Range training and target practice activities.

(5) Military real estate areas that are being or have been used as bombing ranges, artillery impact areas, target areas, and other areas exposed to contamination by military munitions, chemicals, pyrotechnics, or other dangerous materials.

(6) All areas designated for live-fire weapons firing and laser training, including recreational ranges, located on Army- or Marine Corps-controlled property.

(7) Civilian training complexes when authorized for Army or Marine Corps active and reserve use.

b. The standards and procedures of this pamphlet are advisory for actual combat conditions.

c. This pamphlet also applies to training outside U.S. territories. U.S. Army or Marine Corps installation commanders will apply the provisions of this pamphlet or host nation agreements as appropriate.

d. Surface danger zones (SDZs) in this pamphlet represent minimum safety requirements. They are adequate only when employed with properly functioning safety equipment and devices and when trained and competent personnel follow published firing procedures.

e. Except for airspace and water traffic safety requirements, the standards and procedures in this pamphlet do not apply to development, proof and function test ranges, and laboratories. However, major Army commands (MACOMs) that have such ranges and laboratories are required to develop and apply alternate standards that are appropriate to the mission and to ensure the preservation of life and property. To ensure range safety measures are adequate for protecting equipment and personnel, development, proof and function test ranges, and laboratories are required to submit an adjusted SDZ and base justification of adjusted SDZ on risk-mitigating measures, failure mode and effects analysis, inspection and test procedures (for example, x ray or functional component validation), analytical data (for example, Monte Carlo and Six Degrees of Freedom simulations), and empirical data from the same missile or missile with similar flight characteristics. The applicable activity commander will approve the adjusted SDZ.

1–5. Deviations

a. Deviations may be granted based on critical mission requirements that conflict with regulatory standards in accordance with AR 385–63/MCO 3570.1B. Deviations are limited to—

(1) Reducing SDZ dimensions when terrain, artificial barriers, or other compensating factors make smaller SDZs safe.

(2) Modifying prescribed firing procedures appropriate for a state of training of participating personnel to increase training realism.

(3) Allowing personnel who are not directly participating in the actual conduct of training within the SDZ.

b. Deviations applied to SDZs extending beyond installation boundaries must be based on the ability to contain projectiles, hazardous fragments, laser beams and both vertical and horizontal ricochet sufficiently within the installation boundaries, and areas under military control (for example, leased land or training areas and facilities acquired through Memorandum of Understanding or Memorandum of Agreement.) Probability of hazardous fragment escape must not present a greater hazard than 1:1,000,000 (10^{-6})(unlikely) to the public.

c. As a minimum, all deviation authorizations will contain the following, as appropriate:

Appendix B
Bat Wing Surface Danger Zones

B-1. Firing conditions

SDZs in this appendix provide for greater containment of all ricochets. They should be considered when designing ranges that involve fire and movement, or where ricochet hazards outside the range complex boundary may endanger nonparticipating personnel, or the general public. Where bat wing SDZs have already been applied or can be employed without significant impact on range operations, the bat wing SDZs should be implemented.

B-2. Surface danger zone

a. Figure B-1 depicts the SDZ for small arms, machine guns, shotguns, and other direct fire weapons without explosive projectiles, firing from a single firing position along the GTL to a single target.

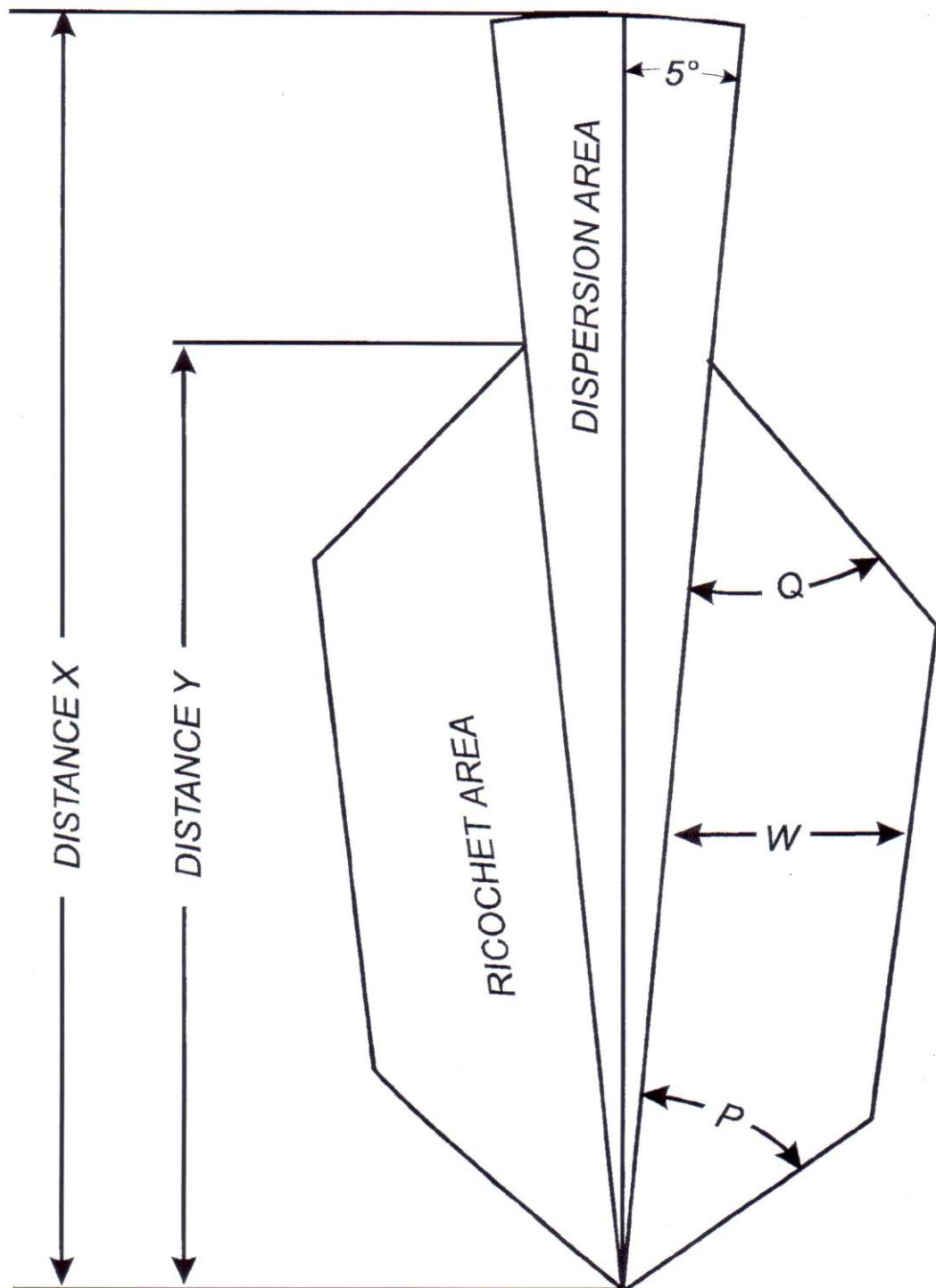


Figure B-1. SDZ for direct-fire weapons without explosive projectiles

c. When the nature or extent of training requires multiple firing positions, bisect the GTL longitudinally and expand the GTL to accommodate multiple targets. This establishes left and right limits of fire.

d. When the nature or extent of training requires moving targets, bisect the GTL longitudinally and expand the GTL to accommodate moving targets. This establishes left and right limits of fire.

e. Table B-1 provides SDZ dimensions with corresponding deflection values (area *W*, angles *P* and *Q*) for engaging various target media, earth, water, steel, or concrete for small arms, machine guns, shotguns, and other direct fire weapons without explosive projectiles.

Table B-1
SDZs for direct-fire weapons without explosive projectiles

Caliber	Impact media	Distance	Distance	Area	Vertical	Angle	Angle
		<i>X</i>	<i>Y</i>	<i>W</i>	Hazard	<i>P</i>	<i>Q</i>
		(in meters)				(in degrees)	
12 gage Slug	Earth/water Steel/concrete	1,073 1,073	710 830	125 287	136 197	21.96 56.91	33.34 40.17
.22 caliber Long rifle, M24	Earth/water Steel/concrete	1,400 1,400	1,033 1,125	155 386	96 245	24.00 63.40	15.90 30.30
.38 caliber M41 Ball	Earth/water Steel/concrete	1,806 1,806	1,110 1,258	153 389	89 245	22.57 60.95	16.07 35.36
9 mm M882, ball	Earth/water Steel/concrete	1,800 1,800	1,077 1,211	158 399	93 253	23.10 61.10	15.80 30.40
.45 caliber M1911 Pistol/SMG	Earth/water Steel/concrete	1,690 1,690	1,016 1,111	117 290	100 186	21.11 54.74	16.69 30.77
5.56 mm M193 Ball	Earth/water Steel/concrete	3,100 3,100	2,004 1,666	458 323	319 219	35.20 19.00	23.10 26.90
5.56 mm M196 Tracer	Earth/water Steel/concrete	3,100 3,100	2,066 2,023	362 243	355 243	35.10 19.20	26.80 22.80
5.56 mm M855 Ball	Earth/water Steel/concrete	3,437 3,437	2,029 1,810	462 334	325 229	34.20 18.80	22.40 25.20
5.56 mm M856 Tracer	Earth/water Steel/concrete	3,089 3,089	1,607 1,592	355 277	261 261	32.80 18.60	23.20 21.00
5.56 mm M862 Plastic	Earth/water Steel/concrete	250 250	165 136	24 5	16 4	15.40 3.30	20.00 7.30
7.62 mm M118 Special	Earth/water Steel/concrete	5,288 5,288	4,800 5,137	1,545 990	752 490	43.81 20.17	38.73 41.29
7.62 mm M80 Ball	Earth/water Steel/concrete	4,100 4,100	4,073 4,053	1,461 861	706 447	43.54 20.04	38.90 75.54
.50 caliber M858 Ball, plastic	Earth/water Steel/concrete	700 700	398 415	20 53	41 41	4.28 11.65	9.16 21.14
.50 caliber M860 Tracer, plastic	Earth/water Steel/concrete	700 700	398 415	20 53	41 41	4.28 11.65	9.16 21.14
.50 caliber M2 AP	Earth/water Steel/concrete	6,100 6,100	5,142 4,300	1,659 718	904 462	40.80 16.30	69.60 33.10
.50 caliber M2 Ball	Earth/water Steel/concrete	6,500 6,500	5,211 4,147	1652 714	901 478	38.19 16.03	63.35 44.13
20 mm M220 TP-T	Earth Water Steel Concrete	3,940 3,940 3,940 3,940	3,340 3,040 3,290 3,260	581 558 804 765	317 311 513 447	25.83 26.08 36.66 34.33	22.83 30.96 47.76 34.09
20 mm M55A2 TP	Earth Water Steel Concrete	4,500 4,500 4,500 4,500	3,780 3,500 4,053 3,750	733 737 1,025 969	357 350 585 509	25.74 26.16 38.14 34.12	33.20 36.66 36.82 37.78

Appendix C

Surface Danger Zone Design

C-1. Description

a. SDZs for direct- and indirect-fire weapons, as determined by test methods and computer simulation systems, have similar parameters or components. Their size and shape vary, because of performance characteristics of the weapon system and ammunition models. Figures C-1 and C-2 illustrate direct- and indirect-fire SDZs, respectively. Descriptions of the SDZ parameters or components are in the glossary, section II, terms.

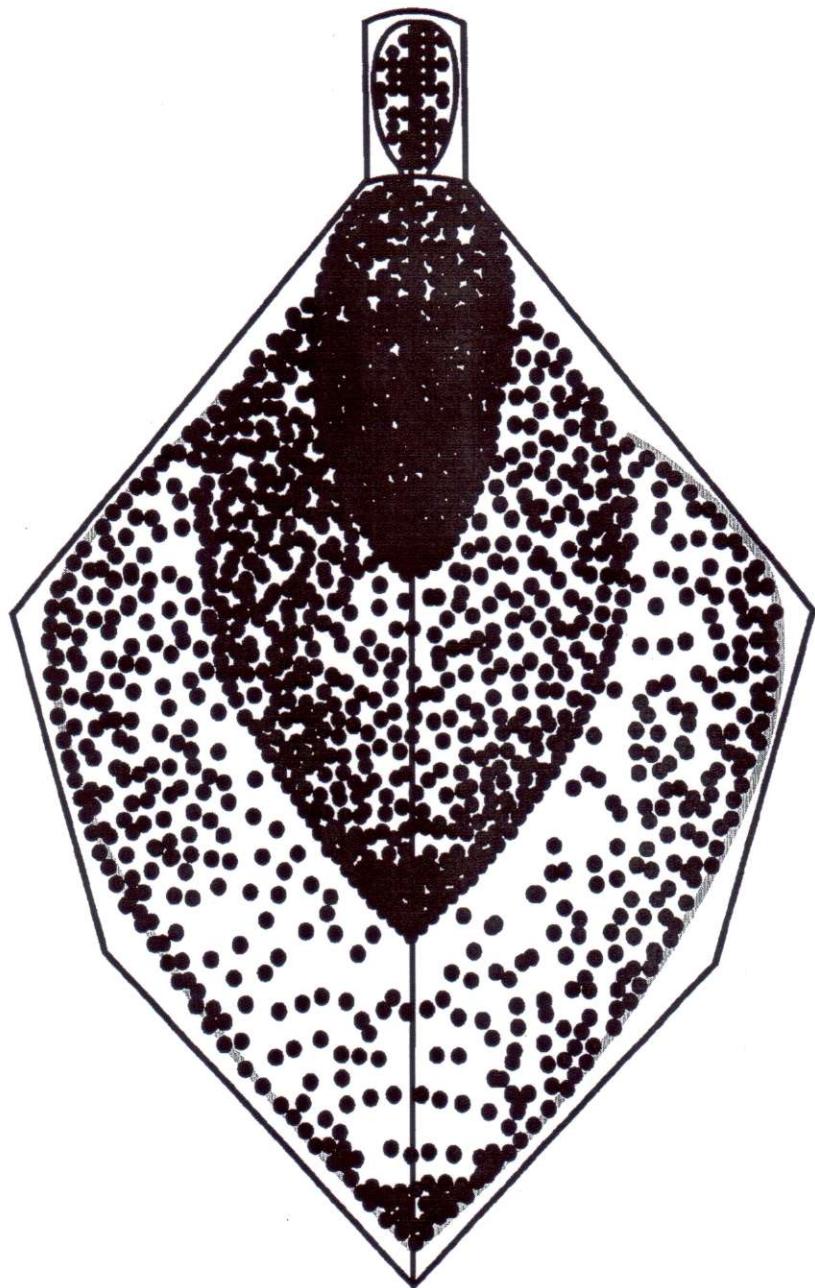


Figure C-3. Ballistic footprint and associated SDZ

c. Lateral SDZ requirements are generally greater at shorter ranges because of higher projectile velocities. As the target range increases, projectile velocity decreases; this generally results in a narrower SDZ further down range. Projectiles impact more perpendicular to the earth as the quadrant elevation increases. Lateral ricochets diminish significantly at quadrant elevations above 15 degrees.

d. Unique weapon systems contained in this pamphlet require special SDZs (for example, MLRS, TOW, Patriot, and Improved Hawk). The parameters or components of these special SDZs are similar to those listed above, however, the manner in which the SDZs are constructed is different. This pamphlet describes the construction of the special SDZs for these unique weapon systems.

C-2. Basic SDZs

a. The basis for construction of any SDZ is fundamental. All SDZs, regardless of complexity, are drawn from a point or points of reference. With a fundamental understanding of the need for, and basis of, SDZs, and this pamphlet, users will be able to construct any SDZ. It is imperative to use this pamphlet as a reference in constructing all SDZs.

b. To construct an accurate and precise SDZ, users will need the following equipment as a minimum: compass, protractor, plotting scale, and fine point pencil. Dimensions of SDZ parameters (for example, angles P and Q , areas A and B) are given in the respective table for each weapon system. Draw lines lightly in pencil, at first, so unnecessary construction lines can be erased more easily; then go back and darken the lines that define the SDZ.

c. The procedure outlined below is one way to construct an SDZ. It is suitable for SDZs that are based on current test methods and computer simulation models.

(1) Determine the firing position and the target position. Draw a straight line from the firing position through the target position to the required distance X (plus the additional distance requirement for area B , if applicable). This establishes the GTL (missile target line, rocket target line, and so forth). Place a tic mark on the GTL at distance X (include area B , if applicable) for future reference. (See figure C-4.)

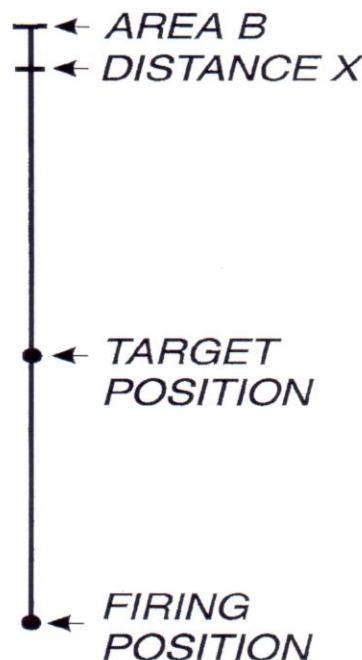


Figure C-4. Gun target line

(2) At the firing position, measure out to the left and right of the GTL, with a protractor, the required degrees to establish the dispersion area; place tic marks. Draw a straight line from the firing position through each tic mark out to distance X . (See figure C-5.)

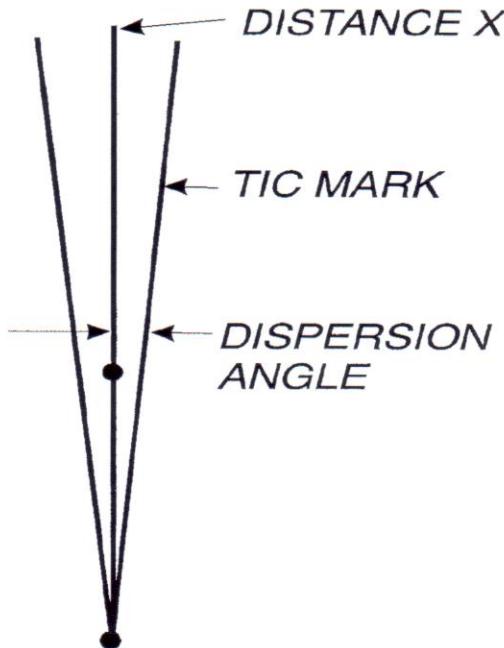


Figure C-5. Dispersion area angles

(3) From the firing position, scribe an arc between the left and right limits of the dispersion area (i.e., the lines constructed in (2) above), with a compass, using distance X as the radius. This completes the dispersion area. (See figure C-6.)

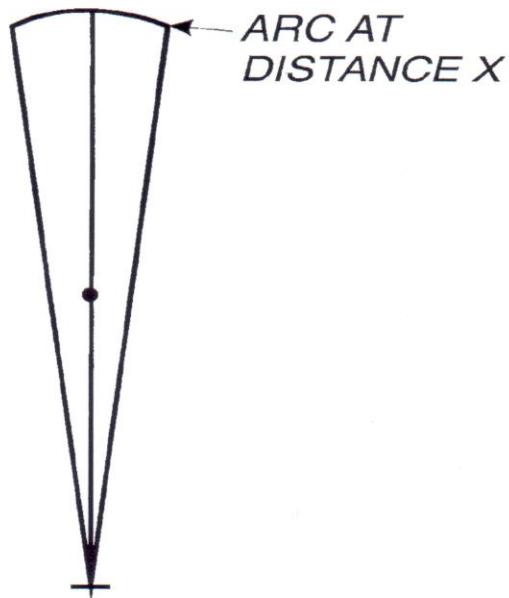


Figure C-6. Dispersion area

(4) Place a tic mark at distance Y along the left and right limit of the dispersion area for future reference. (See figure C-7.)

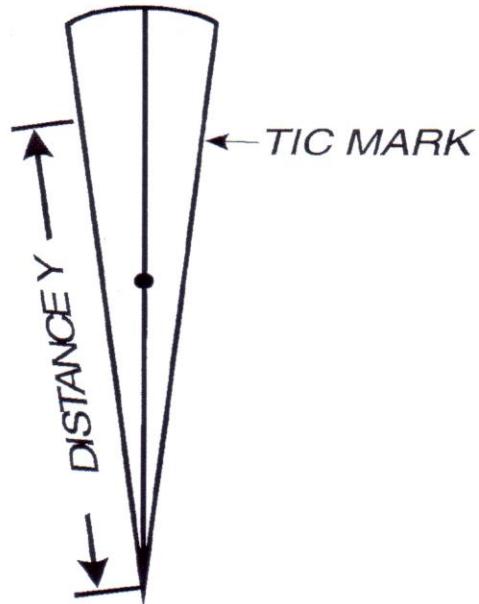


Figure C-7. Tic marks for distance Y

(5) At the firing position, using a protractor, measure from the left and right limits of the dispersion area determined above, the required degrees for ricochet area, angle P ; place tic marks. Draw a straight line from the firing position through the tic marks. Next, at distance Y , measure with a protractor, from the left and right limits of the dispersion area, back toward the firing position with a protractor the required degrees for ricochet area, angle Q ; place tic marks. Draw a straight line from the tic marks at distance Y (step 4, above) through the tic marks just drawn. (See figure C-8.)

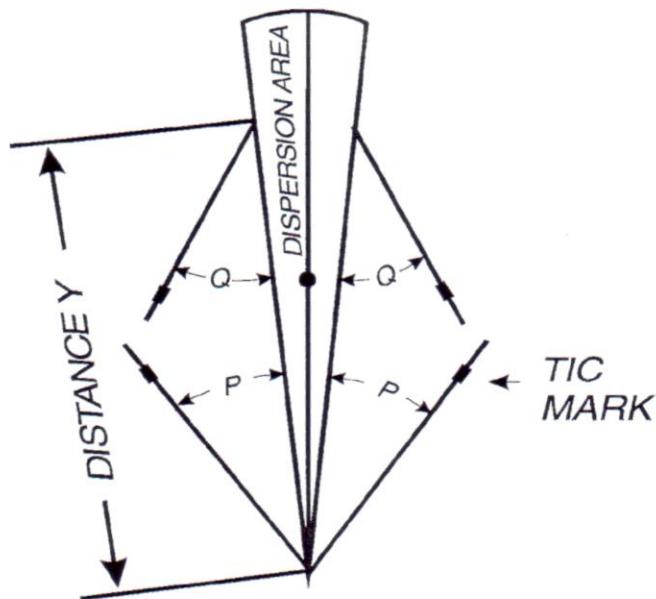
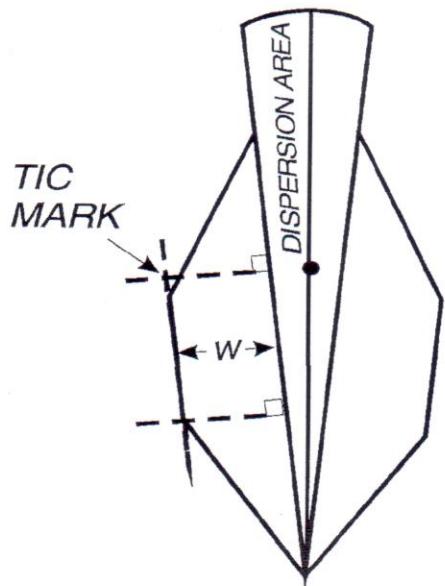


Figure C-8. Addition of angles P and Q

(6) At two locations, measure perpendicular from the left and right limits of the dispersion area the required distance for area W and place tic marks. Draw a straight line through the tic marks to intersect the lines previously drawn for angles P and Q . This completes the ricochet area. (See figure C-9.)

Figure C-9. Completion of area *W*

(7) If areas *A* and *B* are required, draw these areas parallel to the dispersion area and ricochet area. Measure perpendicular at two locations along the perimeter of the dispersion area and ricochet area, place a tic mark. Next, connect the tic marks with straight lines until they intersect the 25° angle constructed to the outside of the angle *P* line. This completes area *A*. Plot the value of area *B* at the down range end of the beyond distance *X* and scribe an arc between the area *A* boundaries. This completes area *B*. (See figure C-10.)